

Listing of the Claims:

1. (Original) A method of fabricating an interconnect structure having reduced internal stress, comprising the steps of:
 - 5 providing a semiconductor substrate having a base dielectric layer thereon;
forming a damascened interconnect structure in the base dielectric layer;
capping the damascened interconnect structure and the base dielectric layer with a first dielectric barrier;
executing a first chemical vapor deposition (CVD) process within a CVD reactor
 - 10 to deposit a first low-k dielectric film having a pre-selected thickness onto the first dielectric barrier;
executing a first cooling process within the CVD reactor for cooling down the first low-k dielectric film;
executing a second CVD process within the CVD reactor to deposit a second
 - 15 low-k dielectric film having the pre-selected thickness onto the first low-k dielectric film;
executing a second cooling process within the CVD reactor for cooling down the first and second low-k dielectric films, wherein the first and second low-k dielectric films constitute a low-k film stack having reduced internal stress; and
 - 20 capping the low-k film stack with a second dielectric barrier.
2. (Original) The method according to claim 1 wherein the first and second low-k dielectric films have substantially the same compositions.
- 25 3. (Original) The method according to claim 1 wherein the pre-selected thickness is about 0.1~0.15 microns.
4. (Original) The method according to claim 1 wherein the first dielectric barrier comprises silicon nitride.
- 30 5. (Original) The method according to claim 1 wherein the second dielectric barrier

comprises silicon nitride.

6. (Original) The method according to claim 1 wherein both of the first and second low-k dielectric films have a dielectric constant that is less than 3.0.

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7. (Original) The method according to claim 1 wherein the damascened interconnect structure comprises a barrier layer and a copper core that are embedded in the base dielectric layer.

10 8. (Currently Amended) A copper damascene process, comprising:
providing a semiconductor substrate having a base dielectric layer thereon;
forming a first damascened copper interconnect structure in the base dielectric
layer;
capping the first damascened copper interconnect structure and the base dielectric
15 layer with a dielectric barrier;
executing multiple chemical vapor deposition (CVD) cycles within a CVD
reactor to deposit a low-k dielectric film stack on the first dielectric barrier until
thickness of the low-k dielectric film stack reaches a desired value, wherein each of
the CVD cycles comprises: (1) chemical vapor depositing a low-k dielectric film
20 having a pre-selected thickness; and (2) cooling down the low-k dielectric film within
the CVD reactor; and
forming a second damascened copper interconnect structure in the low-k
dielectric film stack, wherein the first damascened copper interconnect is electrically
connected to the second damascened copper interconnect structure, wherein executing
25 multiple CVD cycles to deposit a low-k dielectric film and cooling down the low-k
dielectric film within CVD reactor reduces internal stress of the low-k dielectric film
stack.

30 9. (Original) The method according to claim 8 wherein the pre-selected thickness is
about 0.1~0.15 microns.

10. (Original) The method according to claim 8 wherein the dielectric barrier

comprises silicon nitride.

11. (Original) The method according to claim 8 wherein the low-k dielectric film stack has a dielectric constant that is less than 3.0.

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12. (Original) The method according to claim 8 wherein the damascened copper interconnect structure comprises a barrier layer and a copper core that are embedded in the base dielectric layer.

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